

Remarks/Arguments

Claims 1-44 are pending in this application. Support for the amendments to claims 1 and 18 is found at least at page 15, lines 12-26 and page 17, line 29-page 18, line 31 and page 13, lines 6-17. Support for new claims 39-44 is found at least at page 15, line 23-page 17, line 2, and page 17, line 20-page 18, line 31, and page 19, line 24-page 20, line 18.

CLAIM REJECTIONS UNDER 35 USC 102(b)

Claim 1 is rejected as being anticipated by US patent 6,252,976 to Schildkraut. Claim 1, as amended, is allowable over Schildkraut for the following reason. Schildkraut does not disclose identifying a first group of pixels that correspond to a face within a digital image including comparing one or more detected luminance variations between sub-groups within said first group of pixels with one or more expected luminance variations of digital facial images. Instead, Schildkraut discloses to detect skin tone for face detection. However, skin tone detection is an unreliable way to do face detection, as has been determined during research with regard to the present invention.

One problem with using skin tone for detecting faces as disclosed by Schildkraut is that its color varies quite significantly from person to person, with ambient illumination and camera settings (white balance). Thus, skin tone has to be defined quite broadly in terms of color to ensure that faces are in fact detected. Then, when such broad color range is used, the system picks up detected regions with skin-like color, such as hair, a wall, a beach, and/or a wooden piece of furniture such as a table. A face might overlap a yellow wall or a brown dinner table or a sandy beach, and the whole wall, table or beach might be detected as a skin region. In this case, it is difficult to find face features, because the size of the face and its orientation are not known, and the face may be simply hidden within the image to the Schildkraut's skin-tone based face detection algorithm.

The invention, as set forth at Applicants' amended claim 1, sets forth a method that utilizes luminance variation for performing face detection, which is immune to color variations in skin. Basic luminance variations between features of faces are understood, e.g., eyes are darker than surrounding regions, eyes are dark regions separated by a brighter patch, and so on. By comparing detected luminance variations in a digital image with those understood to correspond to faces, then the face detection of the invention is far more efficient than use of skin tone detection as disclosed by Schildakraut.

Claims 1-8 and 15-25 are rejected under 35 USC 102(b) as being anticipated by US patent no. 7,035,462 to White et al. Claims 1-8 and 15-25, as amended, are allowable over White et al., because White et al. do not disclose identifying a first group of pixels that correspond to a face within a digital image including comparing one or more detected luminance variations between sub-groups within said first group of pixels with one or more expected luminance variations of digital facial images. There is simply no discussion by White et al. regarding face detection particularly using luminance variations.

Claims 1-3, 5, 7-18 and 26-38 are rejected under 35 USC 102(e) as being anticipated by US patent no. 6,940,545 to Ray et al. Claims 1-3, 5, 7-18 and 26-38, as amended, are allowable over Ray et al., because Ray et al. neither teaches identifying a first group of pixels that correspond to a face within a digital image including comparing one or more detected luminance variations between sub-groups within said first group of pixels with one or more expected luminance variations of digital facial images, nor determining a re-compositioned image including a new group of pixels for at least one of the face and the other feature, wherein the new group of pixels is determined based on one or more characteristics of the first or second groups of pixels, or both.

Claim 1 is rejected under 35 USC 102(b) as being anticipated by US patent 6,278,491 to Wang et al. Claim 1, as amended, is allowable over Wang et al. for the reasons that follow. Wang et al. describes replacing pixels in a re-compositioned image with pixels of a "predetermined" color. The new pixels are simple "monochrome" pixels and are not based on any aspects of the face region or the feature it contains. Claim 1, as amended, requires a new group of pixels that is determined based on one or more characteristics of the first and/or second groups of pixels.

NEW CLAIMS

With regard to new claims 39 and 42, none of the relied upon references teaches or suggests, alone or in combination, Applicants' invention as set forth at claim 1 or claim 18, upon which claims 39 and 42 are respectively based. In addition, claims 39 and 42 require that the new group of pixels includes a replacement of substantially all of the pixels in the first group. For example, Wang et al. only describes altering the pixels of a determined facial feature such as the pupil of an eye, but does not teach an altering of the pixels of a determined facial region. Claims 40-41 and 43-44 set forth examples of such altering of pixels of substantially an entire facial region. These include auto-focus, fill-flash, panning, and zooming, the latter further requiring physical re-sizing/re-scaling of the face region and of the surrounding image scene, none of which is taught or suggested by the relied upon references.

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In view of the foregoing, Applicants respectfully submit that all pending claims are allowable, and request the Examiner's early examination of the pending claims in the present application. If the Examiner deems a telephonic discussion would be helpful in the examination of the pending claims, Applicants invite the Examiner to contact the Applicants' representative at (510) 652-6418.

Respectfully submitted,
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